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09/765,806	01/19/2001	Robert L. Gerlach	F064	9171

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EXAMINER

EL SHAMMAA, MARY A

ART UNIT PAPER NUMBER

2881

DATE MAILED: 07/11/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 09/765,806	Applicant(s) GERLACH ET AL.	
	Examiner Mary A. El-Shammaa	Art Unit 2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 14 April 2003.
- 2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-17, 19, 20, 22-25, 27, 29, and 30 is/are rejected.
- 7) ☒ Claim(s) 18, 21, 26 and 28 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 January 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All   b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                  | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____  |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)         | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other:  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 5, and 6 are rejected under 35 U.S.C. 102(b) as being anticipated by Kellogg et al. (4,698,236).

Regarding claim 1, Kellogg et al. discloses a method of using a focused beam of ions to deposit material onto a target or to remove material from a target comprising extracting ions from an ion source; forming the ions into a non-Gaussian, shaped ion beam having at a target plane an average current density lower than that of a similar beam without shaping; providing a target, directing a jet of working material towards the target; and directing the ion beam toward the target, the ion in the beam inducing a reaction of the working material to deposit material onto the target or to remove material from the target (Col. 3, Lines 54-66; Col. 4, Lines 47-57; Col. 7, Lines 54-68; Col. 8, Lines 50-58; Col. 13, Lines 5-8).

Regarding claim 5, Kellogg et al. discloses the non-Gaussian, shaped ion beam being characterized in the target plane by a current density profile having a geometric feature with an edge resolution that is similar to that of a beam without shaping, thereby producing features on the target as fine as those produced by an unshaped beam (Col. 3, Lines 54-66).

Regarding claim 6, Kellogg et al. discloses etching or depositing at the target a pattern corresponding to the shape of the ion beam and then stepping the ion beam to repeat the pattern (Col. 3, Lines 54-66; Col. 5, Lines 1-5).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kellogg et al. in view of Applicants' admitted prior art.

Regarding claims 2-4, Kellogg et al. discloses a non-Gaussian, shaped ion beam, but does not disclose passing the ions through an aperture, forming an image of the aperture on the target, and under focusing the ion beam to produce a uniform current density at the target surface. The Applicants disclose in the Specification a known method of forming an image of the aperture onto the target to form a beam having higher resolution (page 2, lines 12-21). Furthermore, the Applicants disclose a known method of under focusing the ion beam for Gaussian, shaped beams (page 4, lines 14-22). It would have been obvious to one having ordinary skill in the art at the time the invention was made to pass the ions through an aperture and form an image of the aperture on the target, and to under focus the beam because this would achieve the desired non-Gaussian, shaped beam with high resolution at the edges as disclosed by Kellogg et al.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kellogg et al. in view of Jones (5,126,287).

Regarding claim 7, Kellogg et al. does not disclose positioning a straight edge in the path of the ions near the beam center. Jones discloses positioning a straight edge in the path of the ions near the beam center (Col. 5, Lines 19-34). It would have been obvious to one having ordinary skill in the art at the time the invention was made to include this structure to control the shape of the beam at the target plane.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kellogg et al. in view of Corbin et al. (5,973,295).

Regarding claim 8, Kellogg et al. discloses directing a precursor gas toward the target in addition to directing the jet of working material towards the target (Col. 9, Lines 29-56). Kellogg et al. does not disclose the reaction induced by the ion beam including the deposition of a conductive or insulating material. Corbin et al. discloses the deposition of a conductive or insulating material onto a target (Col. 1, Lines 7-9; Col. 5, Lines 23-26). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus and method of Kellogg et al. with the teachings of the deposition of a conductive or insulating layer by Corbin et al. so as to increase the versatility of the apparatus and method.

Claims 9-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kellogg et al. in view of Ohnishi et al. (5,120,925).

Regarding claims 9 and 12, Kellogg et al. discloses a focused ion beam system for irradiating a target positioned at a target plane comprising a vacuum system; an ion beam column positioned within the vacuum system for creating an ion beam for impinging upon a target, the ion beam column producing a non-Gaussian, shaped ion beam having an average current density lower than that of an unshaped beam; a secondary electron or ion detection and imaging system; a gas injection system for directing a jet of gas toward the impact point of the shaped ion beam on the target; and a controller for controlling the shaped ion beam to irradiate an area on the target area or depositing a material onto the target area (Col. 3, Lines 54-66; Col. 4, Lines 47-57; Col. 5, Lines 29-56; Col. 7, Lines 40-68; Col. 8, Lines 50-58; Col. 13, Lines 5-20). Kellogg et al. does not disclose the ion beam column including a high voltage, beam blanking and scanning electrodes. Ohnishi et al. discloses in Figs. 1 and 2 a focused ion beam system comprising an ion beam column including high voltage, beam blanking and scanning electrode (104, 105), a secondary electron or ion detection and imaging system (107, 400), an aperture (102) and a lens (106), a gas injection system (110) for directing a jet of gas (9) toward the impact point of the shaped ion beam onto the target (200) (Col. 3, Lines 9-57; Col. 4, Lines 20-46). It would have been obvious to one having ordinary skill in the art at the time the invention was made to include the high voltage, beam blanking and scanning electrodes of Ohnishi et al. because this would allow for a more precise instrument.

Regarding claims 10 and 11, Kellogg et al. discloses the low current density being uniform across the shaped beam in the target plane and in which the current density profile exhibits at least one geometric feature having a high edge resolution (Col. 3, Lines 54-66; Col. 16, Lines 1-3).

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kellogg et al. in view of Ohnishi et al. in further view of Corbin et al.

Corbin et al. discloses the deposition of a conductive or insulating material onto a target (Col. 1, Lines 7-9; Col. 5, Lines 23-26). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus and method of Kellogg et al. in view of Ohnishi et al. with the teachings of the deposition of a conductive or insulating layer by Corbin et al. so as to increase the versatility of the apparatus and method.

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kellogg et al. in view of Ohnishi et al. in further view of Jones.

Jones discloses positioning a straight edge in the path of the ions near the beam center (Col. 5, Lines 19-34). It would have been obvious to one having ordinary skill in the art at the time the invention was made to include this structure to control the shape of the beam at the target plane.

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kellogg et al. in view of Ohnishi et al. in further view of Applicants' admitted prior art.

Regarding claim 15, the Applicants disclose a known method of under focusing the ion beam for Gaussian, shaped beams (page 4, lines 14-22). It would have been obvious to one having ordinary skill in the art at the time the invention was made to under focus the beam

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because this would achieve the desired non-Gaussian, shaped beam with high resolution at the edges as disclosed by Kellogg et al.

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kellogg et al. in view of Ohnishi et al. in further view of Applicants' admitted prior art in further view of Jones.

Jones discloses an aperture having on or more straight edges (Col. 5, Lines 19-34). It would have been obvious to one having ordinary skill in the art at the time the invention was made to include this structure to control the shape of the beam at the target plane.

Claims 19, 20, 22, 23, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohnishi et al. in view of Applicants' admitted prior art.

Regarding claims 19 and 22, Ohnishi et al. discloses in Figs. 1 and 2, a method and apparatus for producing a shaped ion beam (1) comprising emitting ions from an ion source (100); passing the ion beam (1) through an aperture (102) between the first lens and second lens thereby producing on the target surface an ion impact area having the shape of the aperture (Col. 3, Lines 7-28). Ohnishi et al. does not disclose forming an image of the ion source (100) using a first lens (101) and forming an image of the aperture (102) onto a target surface, thereby producing on the target surface an ion impact area having the shape of the aperture. The Applicants disclose in the Specification a known method of forming an image of the aperture onto the target to form a beam having higher resolution (page 2, lines 12-21). It would have been obvious to one having ordinary skill in the art at the time the invention was made to form

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an image of the ion source and form an image of the aperture because this would result in a desirable beam having high resolution at the edges of the beam.

Regarding claim 20, the Applicants disclose a known method of under focusing the ion beam for Gaussian, shaped beams (page 4, lines 14-22). It would have been obvious to one having ordinary skill in the art at the time the invention was made to under focus the beam because this would achieve the desired non-Gaussian, shaped beam with high resolution at the edges.

Regarding claim 23, Ohnishi et al. discloses a method of producing a shaped ion beam comprising emitting ions from an ion source (100); forming an ion beam (1) from the emitted ions; and passing the ion beam (1) through an aperture (102) (Col. 3, Lines 7-18). Ohnishi et al. does not disclose focusing the ion beam onto a focal plane beyond a target plane to produce at the target plane a beam having a diameter or size greater than the diameter that the beam would have at the focal plane and having an edge resolution not significantly degraded from that of the unshaped beam. The Applicants disclose a known method of under focusing the ion beam for Gaussian, shaped beams (page 4, lines 14-22). It would have been obvious to one having ordinary skill in the art at the time the invention was made to under focus the beam because this would achieve a beam having a diameter or size greater than the diameter that the beam would have at the focal plane and having an edge resolution not significantly degraded from that of the unshaped beam.

Regarding claim 29, Ohnishi et al. discloses an apparatus for producing a shaped ion beam, the apparatus comprising an ion source (100) providing ions for forming an ion beam along an optical axis; an aperture (102) positioned after the ion source and restricting the ion

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beam; and a lens (106) (Col. 3, Lines 9-18). Ohnishi et al. does not disclose under focusing the beam to a crossover point beyond the target plane. The Applicants disclose a known method of under focusing the ion beam for Gaussian, shaped beams (page 4, lines 14-22). It would have been obvious to one having ordinary skill in the art at the time the invention was made to under focus the beam because this would achieve the current density at the target plane being uniform.

Claims 24, 25, 27, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohnishi et al. in view of Applicants' admitted prior art in further view of Jones.

Regarding claims 24, 25, and 30, Jones discloses a rectangular aperture comprising a knife-edge positioned near the center of the beam (See Figs, 6 and 7). It would have been obvious to one having ordinary skill in the art at the time the invention was made to include this structure to control the shape of the beam at the target plane.

Regarding claim 27, the Applicants disclose a known method of under focusing the ion beam for Gaussian, shaped beams (page 4, lines 14-22). It would have been obvious to one having ordinary skill in the art at the time the invention was made to under focus the beam because this would achieve the desired non-Gaussian, shaped beam with high resolution at the edges.

***Allowable Subject Matter***

Claims 18, 21, 26, and 28 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Response to Arguments***

Applicant's arguments with respect to claims 1-30 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***


The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. (5,592,658), (5,916,424), (5,061,850).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mary A. El-Shammaa whose telephone number is 703.308.0851. The examiner can normally be reached on M-F (8:30am-5:00pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R. Lee can be reached on 703.308.4116. The fax phone numbers for the organization where this application or proceeding is assigned are 703.872.9318 for regular communications and 703.872.9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703.872.9317.

mae  
June 27, 2003

  
JOHN R. LEE  
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